Centre Number	Candidate Number	Name

CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

PHYSICAL SCIENCE 0652/02

Paper 2

May/June 2003

1 hour

Candidates answer on the Question Paper.
No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen in the spaces provided on the Question Paper.
You may use a soft pencil for any diagrams, graphs, tables or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.
At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
A copy of the Periodic Table is printed on page 12.

If you have been given a label, look at the details. If any details are incorrect or missing, please fill in your correct details in the space given at the top of this page.

Stick your personal label here, if provided.

For Examiner's Use	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
Total	

This document consists of **12** printed pages.

University of Cambridge Local Examinations Syndicate
[Turn over

1 An isotope of silicon has the atomic notation $^{29}_{14}Si$.

Use this information to complete the table in Fig. 1.1.

number of protons in nucleus of atom	14
number of neutrons in nucleus of atom	
total number of electrons around nucleus	
arrangement of these electrons in shells	

Fig. 1.1

[3]

2 Fig. 2.1 shows an electromagnetic relay switch.

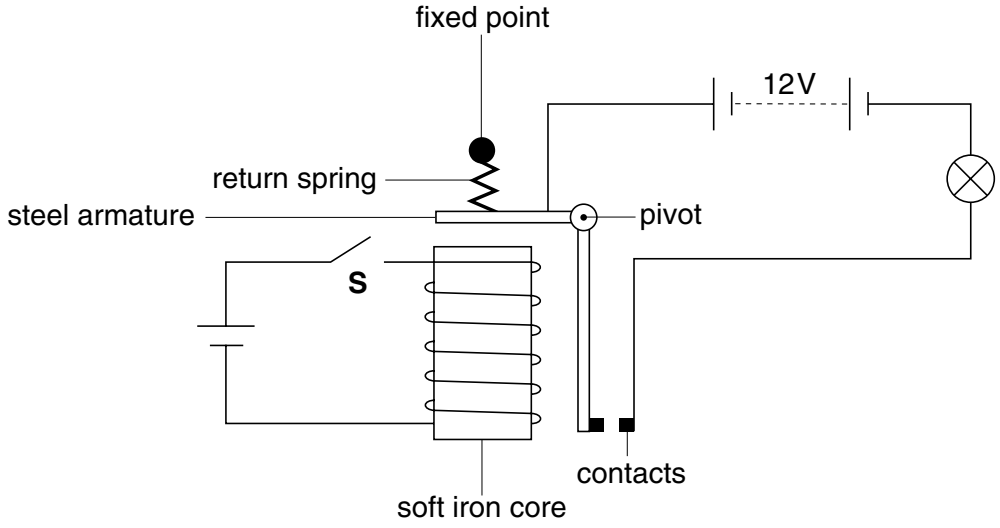


Fig. 2.1

(a) (i) Explain why the contacts close when switch **S** is closed.

.....

.....

.....

.....[3]

(ii) Explain why soft iron, not steel, is used for the core.

.....

.....[2]

(b) The lamp in the circuit has a current of 4 A through it when there is a potential difference of 12 V across it.

Calculate the resistance of the lamp. Show your working and state the unit of resistance.

resistance = ... [3]

3 **(a)** **(i)** Draw a 'dot-cross' diagram to describe the bonding in a molecule of methane, CH_4. You need show only the outer electrons of each atom.

[2]

(ii) Name the type of bonding between the atoms in the methane molecule.

.....[1]

(b) One molecule of an alcohol consists of one carbon atom, four hydrogen atoms and one oxygen atom.

(i) Write the structural formula of this compound.

.....[2]

(ii) Calculate the relative molecular mass, M_r, of this compound.

[1]

4 **(a)** Fig. 4.1 shows parallel light entering a converging lens.

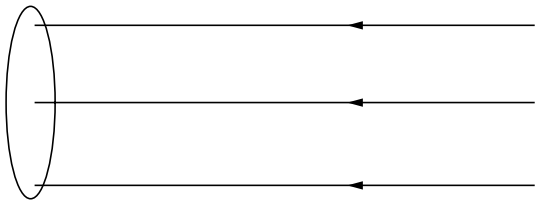


Fig. 4.1

(i) Complete the diagram to show the paths of the rays of light after passing through the lens.

(ii) Mark the focal length of the lens on the diagram. [3]

(b) Fig. 4.2 shows a ray of light striking a mirror.

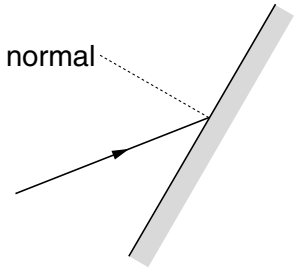


Fig. 4.2

(i) Mark the angle of incidence at the mirror and label it ***i***.

(ii) Complete the path of the ray of light after it strikes the mirror. [2]

5 **(a)** In an experiment using Group VII elements, a student adds bromine water to a colourless solution of potassium iodide. The solution changes to an orange–brown colour.

In terms of the bromine reacting with the iodide ion, state the reason for this change of colour.

.....

.....

.....[2]

(b) Complete the table in Fig. 5.1 about ethane and ethene.

	ethane	ethene
diagram for structure of molecule		
effect of hydrocarbon on bromine water		

Fig. 5.1

[4]

6 **(a)** Fig. 6.1 shows a liquid-in-glass thermometer.

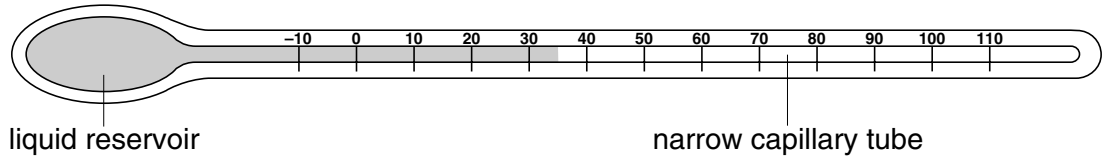


Fig. 6.1

(i) Name a suitable liquid to use in the thermometer. .....

(ii) State the reading on the thermometer. ..... °C

(iii) Explain why a narrow capillary tube is used.

.....

.....[3]

(b) The thermometer bulb is put in melting ice.

(i) Explain why the liquid moves in the capillary tube.

.....

.....

.....

(ii) Mark on the diagram the new position of the liquid. [3]

7 **(a)** Use the kinetic particle theory of matter to explain why energy is needed to melt a solid, at its melting point, to form a liquid.

.....

.....

.....[2]

(b) A student puts a drop of coloured ink into water. The ink slowly spreads throughout the water.

Use the kinetic particle theory of matter to explain this observation.

.....

.....

.....[2]

8 **(a)** Fig. 8.1 shows water waves going from deep water into shallow water. The arrows show the direction of the waves in the deep water.

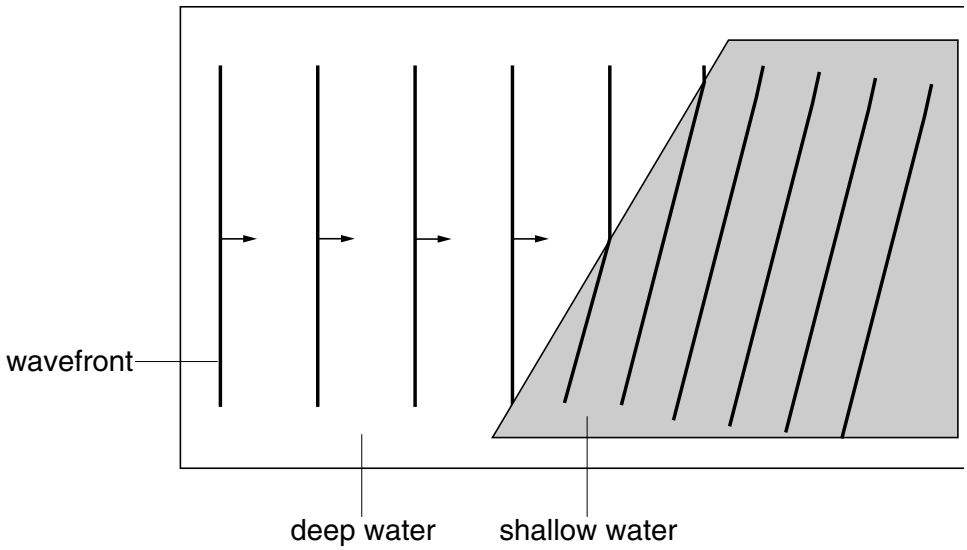


Fig. 8.1

(a) **(i)** Name the process illustrated. .....

(ii) Draw an arrow to show the direction of the waves in the shallow water. [2]

(b) When the waves enter the shallow water, state what happens to

(i) their speed, ...

(ii) their frequency, ...

(iii) their wavelength. .....[3]

9 A student is asked to prepare the salt calcium chloride from powdered limestone, calcium carbonate.

(a) Name the acid she must use.

.....[1]

(b) She adds powdered limestone gradually to the acid in a beaker, stirring frequently. A gas is produced.

(i) Name the gas produced in this reaction.

.....[1]

(ii) Describe a test to identify the gas produced in this reaction.

test .....

result .....

[2]

(c) She continues to add powdered limestone until no further reaction occurs.

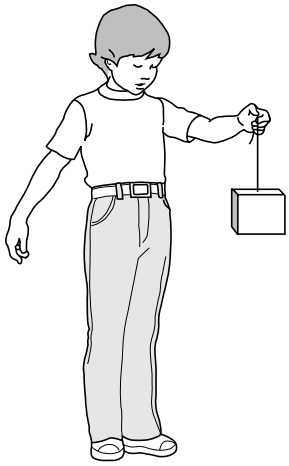
Describe how to obtain solid calcium chloride from the mixture in the beaker.

.....

.....

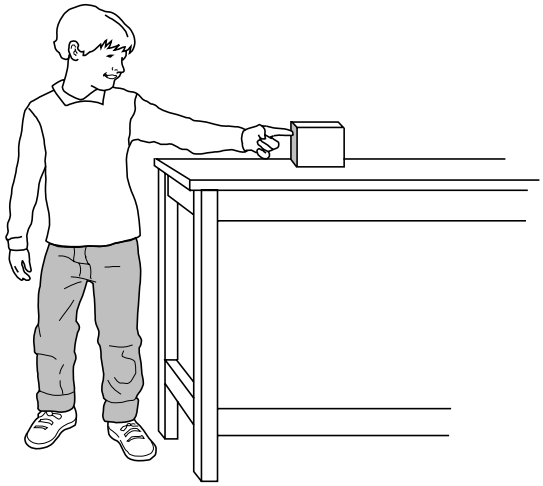
.....[2]

10 Fig. 10.1 shows two examples of a boy applying a force to an object.



example 1

The boy holds a box in a steady position.



example 2

The boy pushes the box along the bench.

Fig. 10.1

(a) State and explain in which example the boy is doing useful work on the box.

.....

.....

.....[2]

(b) The box has a mass of 1.8 kg.

Calculate the weight of the box. (g = 10 N/kg)

weight = ... [2]

(c) In example **1**, the boy drops the box.

Describe the motion of the box as it falls to the ground.

.....

.....[2]

11 Most fuels are chemicals which burn in air.

(a) Hydrogen burns in air to form water vapour.

Use this example to explain the meaning of *oxidation*.

.....

.....

.....[2]

(b) In terms of energy, state why hydrogen is useful as a fuel.

.....

.....[1]

(c) Explain why hydrogen is described as a *clean* fuel.

.....

.....

.....[2]

[Turn over

DATA SHEET
The Periodic Table of the Elements

Group																
I	II										III	IV	V	VI	VII	0
							1 H Hydrogen 1									4 He Helium 2
7 Li Lithium 3	9 Be Beryllium 4										11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10
23 Na Sodium 11	24 Mg Magnesium 12										27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulphur 16	35.5 Cl Chlorine 17	40 Ar Argon 18
39 K Potassium 19	40 Ca Calcium 20	45 Sc Scandium 21	48 Ti Titanium 22	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 28	64 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36
85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	Tc Technetium 43	101 Ru Ruthenium 44	103 Rh Rhodium 45	106 Pd Palladium 46	108 Ag Silver 47	112 Cd Cadmium 48	115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54
133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57 *	178 Hf Hafnium 72	181 Ta Tantalum 73	184 W Tungsten 74	186 Re Rhenium 75	190 Os Osmium 76	192 Ir Iridium 77	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	Po Polonium 84	At Astatine 85	Rn Radon 86
Fr Francium 87	226 Ra Radius 88	227 Ac Actinium 89 †														

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	Pm Promethium 61	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71
232 Th Thorium 90	Pa Protactinium 91	238 U Uranium 92	Np Neptunium 93	Pu Plutonium 94	Am Americium 95	Cm Curium 96	Bk Berkelium 97	Cf Californium 98	Es Einsteinium 99	Fm Fermium 100	Md Mendelevium 101	No Nobelium 102	Lr Lawrencium 103

*58-71 Lanthanoid series
†90-103 Actinoid series

Key

a	a = relative atomic mass
X	X = atomic symbol
b	b = proton (atomic) number

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).